

The strength of brass/Sn-Pb-Sb solder joints containing 0 to 10% Sb

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The strength of brass/Sn-Pb-Sb solder joints has been determined for solders containing 0 to 10% Sb and the fracture process examined by microscopical techniques. Intermetallic formation by interdiffusion in the Cu-Zn/Sn-Pb-Sb and Cu-Zn/Pb-Sb systems were also investigated. As the amount of antimony in the solder increases the thickness and hardness of the intermetallic layer increases, and at and above 4% Sb cuboids of SnSb form in the solder. Antimony causes solid-solution strengthening of the joint up to 3% Sb and a ductile fracture occurs at the solder/intermetallic interface. At and above 4% Sb there is a fall in strength with a cleavage type of fracture associated with SnSb in the solder, and at the 8 and 10% Sb levels with fracture in the intermetallic layer. Additions of up to 10% Sb in the solder reduce the shear strength by only 10%, but cause the joint to have a variable and occasionally very low fatigue resistance. Interdiffusion studies show that the Cu-Sn intermetallic phase formed with the antimony-containing solder is not based on the ϵ -phase, and is probably based on the η -phase in the Cu-Sn-Sb system.
